The piece A can be raised or lowered and fixed at any point so that various degrees of enlargement in the drawing are secured. Upon the stage I have a piece of plate glass $1\frac{1}{2} \times 3$ in. upon which my dissections are usually made. A space in the center of this glass slip is ruled to millimeters, twenty-five millimeters each way. This ruling, as made for me by J. W. Queen & Co., does not interfere at all with the work of dissecting, while it enables one to measure in the easiest possible way any object on the plate, and in making the drawings the scale of enlargement is always before you and can be noted in a moment. The slip of glass is held to the stage by spring clips which are attached to the stage but are not shown in the figure.

In making drawings for photo-engraving it is essential that the lines be black. For this purpose Higgins' American drawing ink is very good. An excellent pen for very fine work is No. 1459 of Keuffel & Esser.

F. LAMSON SCRIBNER.

Plan for laboratory work in Chemical Botany.*—Chemistry furnishes the means for investigating plants. The chemical study of a plant includes not only macro- and micro-chemical work, but also gross and minute anatomy study Two years ago when I saw Prof. Goodale repeat Pfeffer's experiment of putting together certain constituents and building up a cell, I also saw that cell form was not fundamental, but that construction lay back of form and determined it Form is a property of a substance, so to speak. If this is so, even the study of anatomy falls under chemistry and it determines how a plant shall be investigated.

Organic chemistry has two departments. As a special and not an inclusive subject, it investigates elements and compounds in themselves and in their relation to each other apart from their place of occurence. When a study is made of the combination and relation of these substances under what is generally termed life, botany has been entered upon. That is to say, that department of organic chemistry termed the proximate analysis of plants is divisible. One of its subdivisions really belongs to botany and should be relegated to it.

Whatever may be true in other countries, the chemical plant study now being done in America is not alone imperfect in results but *methods*. The chemist extracts the various compounds from the plants and examines them without regard to their relation to the plant. The botanist does little better. With the highest power of his microscope, he entirely misses many of the constituents of the plant. It would seem as if there ought to be a combination of these two modes of investigation, that is, that macro-chemical study of the plant should be accompanied by a micro-chemical study. One who has ascertained the presence and quantity of the more important constituents is prepared to trace these substances in its various tissues. The comparative study that is then possible needs no emphasis.

On page 179 of the July number of the BOTANICAL GAZETTE I gave a scheme of analysis in which macro- and micro-chemical work are combined. I shall not repeat it here, but an examination of that scheme will be necessary

* Read before the A. A. A. S., Buffalo meeting, 1886.

before, not only the laboratory arrangement I am about to describe, but the whole bearing of the paper can be really understood.

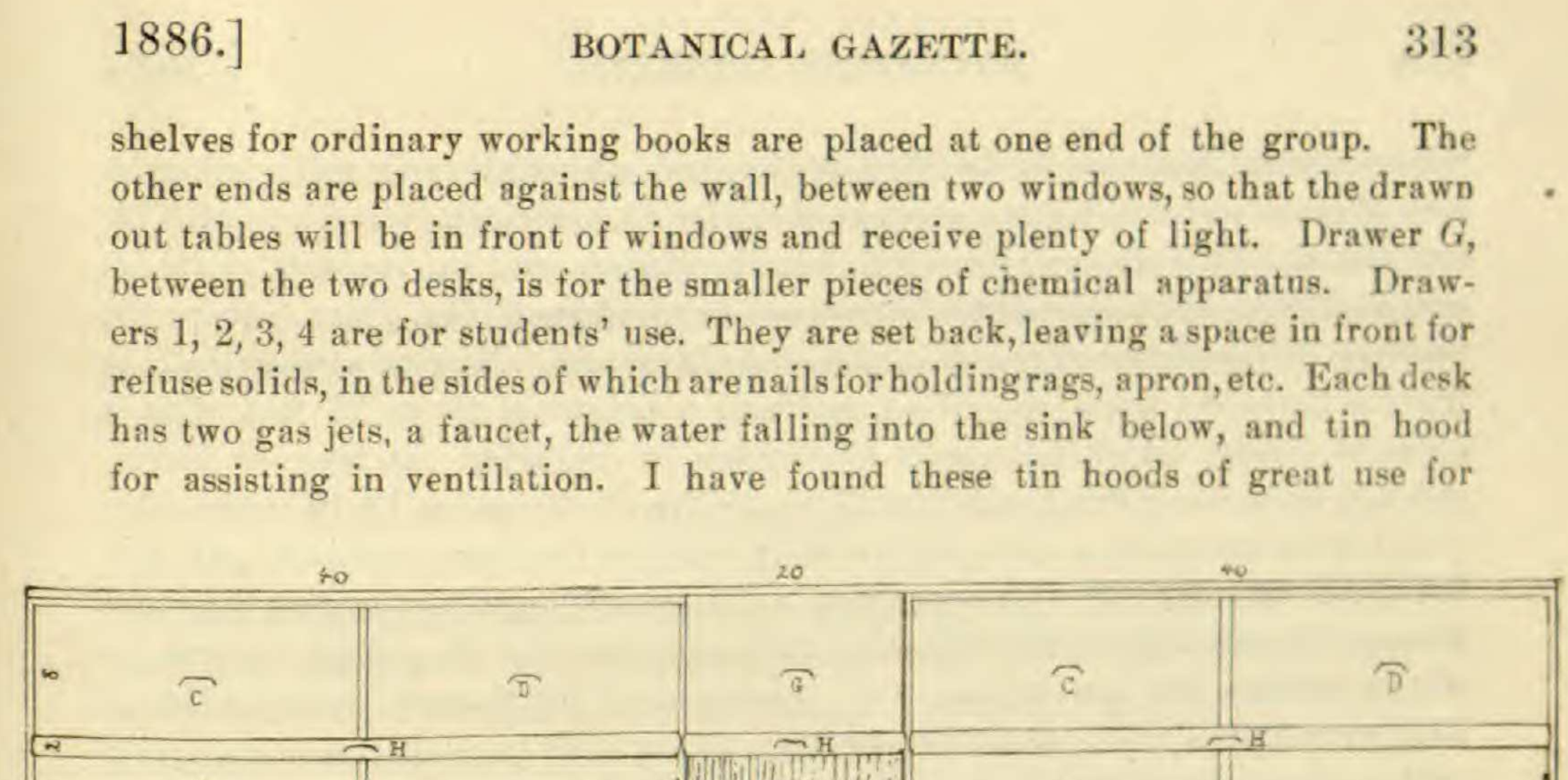
That scheme includes the more important plant products, and by studying any plant as indicated the student is acquainted with a good number of them. In spite of time required, the qualitive value of the quantitative work makes its omission impossible. It frequently tells where the individuality or active principle of the plant lies. Of course this is the real end of botanical proximate analysis.

The books needed in carrying out this analysis are easily obtained. Prof. Goodale and Bessey's botanies and Prof. Trelease's translation of Poulsen's Botanical Micro-Chemistry give directions for the micro-chemical work, and Dragendorff's Plant Analysis for the macro-chemical. Dragendorff's book is rather difficult for beginners, but can be supplemented by the investigations of some one who has followed his general plan. Miss Helen Abbott read a paper, entitled "A chemical study of Yucca Angustifolia," before the Association last year that seems to me particularly suited to this purpose. It is something more than an intelligent following of Dragendorff. It is a model as regards the use of the five senses and in its deductions from what is observed. This last alone would be sufficient reason for placing it before students.

The plant to be taken depends upon the end in view. If investigators in botany are to be trained a fresh plant will be chosen each time for the purpose of stimulating observation and generalization. If botanical information is to be given in a short period of time some plant whose anatomy is familiar will be selected, though it may be remarked in passing that it is believed, if form depends on composition, the time will come when anatomy study will accompany the macro- and micro-chemical study. Fortunately a valuable laboratory guide for anatomy study has just appeared. For botanical information the plant richest in products and showing its chemical characteristics most readily on the application of proper tests will, of course, answer best. If this plant was one, one or more of whose constituents were sold on the market, these could then be obtained in sufficient quanties to allow that fuller study that is not possible with the amounts obtained in the above analysis.

If the introductory remark that chemistry lies at the bottom of all botanical work is accepted, then a botanical laboratory will be a chemical laboratory with convenient arrangements for plant study. I have here a plan of a laboratory desk that I have arranged for the work. While a modified chemical laboratory desk it seems to me not unsuited to all work now generally done in botanical laboratories. The desk is 40 in. lo: g, 36 in. high, and 31 in. deep. It has three drawers and three cupboards. Cupboard *A* is for the compound microscope, drawer *B* for the apparatus generally used with it, and *C* for mounting materials. *D* is for the simple microscope and other apparatus used in analyzing flowers, *E* is for holding bottles of material undergoing maceration, and *F* for fresh plants. *H'* can be drawn out and used for holding mounted specimens from the herbarium near by. *HH* are pieces that form a table for the compound or simple microscope when drawn out. The desks are set in groups of four, as a whole having the shape of a truncated triangle. Book-

shelves for ordinary working books are placed at one end of the group. The other ends are placed against the wall, between two windows, so that the drawn out tables will be in front of windows and receive plenty of light. Drawer *G*, between the two desks, is for the smaller pieces of chemical apparatus. Drawers 1, 2, 3, 4 are for students' use. They are set back, leaving a space in front for refuse solids, in the sides of which are nails for holding rags, apron, etc. Each desk has two gas jets, a faucet, the water falling into the sink below, and tin hood for assisting in ventilation. I have found these tin hoods of great use for



PLAN OF LABORATORY DESK.

this purpose. I think that with these, and a gas chamber for generating hydrogen-sulphide, chlorine and one or two other gases, the microscope would not be injured by being kept in the laboratory if shut up in close box when not in use.

It is intended that one desk will be furnished with the reagents ordinarily employed in inorganic chemistry. The next with those of organic chemistry. Of these petroleum spirit, ether and absolute alcohol will constitute the chief expense. Petroleum spirit and ether can be readily recovered by using the condenser, so that absolute alcohol might be said to be the only great expense. Even if recovered it could only be employed as a weaker alcohol.

The individual desks are to be furnished only with the simpler pieces of apparatus as measuring flasks, pieces of platinum, porcelain crucible, etc., etc The balance, polariscope, spectroscope, condenser, platinum dish, etc., will be used in common. It is thought that the additional expense of carrying on the work as laid down will be slight in those places where botanical laboratories are properly equipped for the study of plant anatomy.—LILLIE J. MARTIN.

Some additions to the Sylva of North America.—During the month of April of this year I was able, in company with Messrs. C. G. Faxon and A. H. Curtiss, to make a somewhat detailed examination of the trees of the semi-tropical Florida region, among which should now be included:

Myginda integrifolia Lam. (M? latifolia Chapman, Flora, not Swartz), a